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10/727,157

12/02/2003

Richard Thomas Plunkett

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SILVERBROOK RESEARCH PTY LTD  
393 DARLING STREET  
BALMAIN, 2041  
AUSTRALIA

EXAMINER

CHRZANOWSKI, MATTHEW R

ART UNIT

PAPER NUMBER

2186

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

|                              |   |   |  |
|------------------------------|---|---|--|
| <b>Office Action Summary</b> | <b>Application No.</b><br>10/727,157      | <b>Applicant(s)</b><br>PLUNKETT, RICHARD THOMAS |  |
|                              | <b>Examiner</b><br>Matthew R. Chrzanowski | <b>Art Unit</b><br>2186                         |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 01 June 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-7 and 9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 and 9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                     | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 1-7, 9 rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
2. Claims 1 and 6 recites the limitation "the timeslot" in line 16 of claim 1 and line 14 of claim 6. There is insufficient proper antecedent basis for this limitation in the claim. It is unclear what timeslot the claim language is referring to (ie. a current timeslot, future timeslot, each timeslot). All dependent claims inherit the deficiencies of their parent claims.
3. Claims 1 and 6 recites the limitation "that timeslot" in the most recently amended claim language. There is insufficient proper antecedent basis for this limitation in the claim. It is unclear what timeslot the claim language is referring to (ie. a current timeslot, future timeslot, the timeslot, each timeslot). All dependent claims inherit the deficiencies of their parent claims.

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. **Claims 1-7, 9** rejected under 35 U.S.C. 103(a) as being unpatentable over **Stacovsky et al. (US Patent # 6526484 B1, hereinafter “Stacovsky”)** in view of **Non-Patent Literature (“RIOT-The Scheduling Problem,” hereinafter “NPL2”), Mundkur (US Patent #5537556, hereinafter “Mundkur”), and Johnson (US Patent #5987576, hereinafter “Johnson”).**

Consider **claim 1**, Stacovsky discloses a method for arbitrating between a plurality of access requests issued in relation to a resource by a plurality of requesters (*FIG. 9A-B, 14*), wherein each request can be one of at least two types, a first of the types having a higher latency associated with its performance than at least some of the other types (*it can but not necessarily does; in a system with different processors and memories it is inherit that that there will be access requests of varying latencies, such as*

*different distances between specific processors and memories, and fabrication/manufacturing defects*), the method including the steps of:

(a) receiving a plurality of the access requests (*commands 1, 2: FIG. 14*);

(b) maintaining, in the timeslot arbitrator, a current pointer that points to a current timeslot in a timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list (*FIFO and ordered buffers maintain a current pointer and future or last received pointer to signify the last entry in the queue; use of FIFO memory: column 18, line 19-20; FIG. 18*); and

(c) in the event an access request as arbitrated via the lookahead pointer, initiating performance of the access request, in the timeslot arbitrator, earlier than the position in the list suggests it would be performed should it be started when the current pointer reached the timeslot (*command 3 is executed before command 2, but after 1: FIG. 14*).

each timeslot is configured to enable performance of a write request then either a write request or a read request in that timeslot (*FIGS. 1-21; column 5, lines 39-42; Stacovsky teaches write and/or reads being received in any order dependent upon the sources, programs, etc*).

Stacovsky discloses the use of a FIFO and executing requests out-of-order if prioritized as discussed above, and asserts it is inherent to a FIFO to (b) maintaining a current pointer that points to a current timeslot in a

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timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list. However, if the applicant references FIFO that does not maintains these pointers, Examiner is taking official notice that a First-in-first-out or ordered buffer allows (b) maintaining a current pointer that points to a current timeslot in a timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list (*FIFO and ordered buffers maintain a current pointer and future or last received pointer to signify the last entry in the queue*), and therefore it would have been obvious to one of ordinary skill in the art at the time of the invention because a use of these buffers are a well-known way of indicating order of requests to indicate priority based on order in which the entries were received. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.

Stacovsky orders based on timeslot and prioritizes certain requests, however, Stacovsky may not specifically disclose prioritizing based on if the request is of the first type (if first type, initiate performance earlier than normal position of FIFO).

Furthermore, NPL2 discloses a system which prioritizing higher latency requests earlier than normal ordered operation (*Longest Processing Time (LPT): page 1*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to prioritizing based on if the

request is of the first type in the system of Stacovsky, because NPL2 teaches the LPT is a heuristic used for finding the minimum makespan of a schedule and no one large job will "stick out" at the end of the schedule and dramatically lengthen the completion time of the last job (*page 1*). Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp (*LPT scheduling algorithm*).

Furthermore, Stacovsky may not specifically disclose wherein, in step (c), the earlier position is selected so as to not be adjacent a position in the list for performance of another access request of the first type.

Examiner is taking official notice that different types of access requests can be interleaved so as one type is not adjacent to the same type, and therefore it would have been obvious to one of ordinary skill in the art at the time of the invention because interleaving is a well-known concept which allows for no single type to monopolize a time period, thereby distributing evenly types in the timeslots. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.

Although Stacovsky discloses read and writes types of memory requests to DRAM as shown above, Stacovsky may not disclose non-CPU write request having a higher latency associated with its performance than a non-CPU read request and CPU write request. Mundkur discloses conventional computer architecture includes CPU and peripheral devices

accessing main memory (FIG. 1) and that the non-CPU (peripherals and other devices) requests have a higher latency associated with its performance than CPU requests (*CPU on faster bus to main memory than peripheral slow shared system bus: FIG.1, column 1, lines 16-32*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow CPU and non-CPU requestors access to main memory with two separate buses, wherein non-CPU requests having a higher latency associated with its performance than a CPU request in the system of Stacovsky, because Mundkur teaches this was conventional type of architecture available at the time of the invention. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp

Furthermore, Johnson discloses that a SDRAM memory device itself physically contains the limitation of the write cycle timing having a higher latency associated with its performance than the read cycle timing from the same device (*Tables in columns 7, 9, and 10; column 11, lines 34-40*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use SDRAM which has a write request having a higher latency associated with its performance than a read request in the system of Stacovsky, because Johnson teaches this was a well-known type of DRAM available at the time of the invention.



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Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.

Stacovsky may not disclose implementing this method in an integrated circuit. Examiner takes official notice to the fact that Systems on a Chip (SoC) which contain entire systems on an integrated circuit were well known at the time of the invention and it therefore would have been obvious to one of ordinary skill in the art at the time of the invention to use a SOC because an SOC provides increased speed, reduced energy and power consumption, and small footprint.

Concerning the claim language, each timeslot is configured to enable performance of a CPU write request then either a non-CPU write request or a non-CPU read request in that timeslot (*Stacovsky teaches write and/or reads being received in any order dependent upon the sources, programs, etc. While Mundkur teaches commands can come from CPU or non-CPU (ie peripheral) sources*).

Consider **claims 2**, and as applied to **claim 1** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the method wherein step (c) includes the substep of performing the access request indicated by the lookahead pointer immediately after the access request indicated by the

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current pointer is performed (*Stacovsky: command 3 is executed before command 2, but immediately after command 1: FIG. 14*).

Consider **claim 3**, and as applied to **claim 1** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the method wherein the CPU write request has a lower latency associated with its performance than the non-CPU read request (*Mundkur: CPU on faster bus to main memory than peripheral slow shared system bus: FIG.1, column 1, lines 16-32*), step (c) including the timeslot arbitrator arbitrating in the timeslot list CPU write requests to be interleaved with non-CPU write and read requests (*Stacovsky discloses arbitrating reads and writes as disclosed above and Mundkur and Johnson discloses CPU and non-CPU requests with associated latencies; Examiners official notice from previous action: interleaving requests*).

Consider **claims 4**, and as applied to **claim 3** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the method wherein step (c) includes the substep of performing the access request indicated by the lookahead pointer immediately after the access request indicated by the current pointer is performed (*Stacovsky: command 3 is executed before command 2, but immediately after command 1: FIG. 14*).

Consider **claim 5**, and as applied to **claim 1** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the method wherein the number of timeslots between the timeslot indicated by the lookahead pointer and the timeslot indicated by the current pointer takes into account a latency difference between performing the access requests (*Stacovsky: the timeslots or entries “take into account” the latency difference because they arrive in order of receipt even though relative to time one of higher latency could have been sent before a lower latency time request but received by the arbiter afterwards; NPL2: Furthermore, takes into account priority and latency: page 1*).

Consider **claim 6**, Stacovsky discloses an plurality of integrated circuit including: a plurality of operative units, each of which is capable of issuing a request for access to a memory accessible by the integrated circuit (*FIG. 1A, 9A-B, 14*); and an timeslot arbitrator for arbitrating between requests issued by the operative units for access to the memory (*FIG. 14*), wherein each request can be one of at least two types, a first of the types having a higher latency associated with its performance than at least some of the other types (*it can but not necessarily does; in a system with different processors and memories it is inherit that that there will be access requests of varying latencies, such as different distances between specific processors and memories, and fabrication/manufacturing defects*), the timeslot arbitrator being configured to:

(a) receiving a plurality of the access requests (*commands 1, 2: FIG. 14*);

(b) maintaining a current pointer that points to a current timeslot in a timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list (*FIFO and ordered buffers maintain a current pointer and future or last received pointer to signify the last entry in the queue; use of FIFO memory: column 18, line 19-20*); and

(c) in the event an access request as arbitrated via the lookahead pointer, initiating performance of the access request earlier than the position in the list suggests it would be performed should it be started when the current pointer reached the timeslot (*command 3 is executed before command 2, but after 1: FIG. 14*);

each timeslot is configured to enable performance of a write request then either a write request or a read request in that timeslot (*FIGS. 1-21; column 5, lines 39-42; Stacovsky teaches write and/or reads being received in any order dependent upon the sources, programs, etc*).

Stacovsky discloses the use of a FIFO and executing requests out-of-order if prioritized as discussed above, and asserts it is inherent to a FIFO to (b) maintaining a current pointer that points to a current timeslot in a timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list. However, if the applicant references FIFO that

does not maintains these pointers, Examiner is taking official notice that a First-in-first-out or ordered buffer allows (b) maintaining a current pointer that points to a current timeslot in a timeslot list, and at least one lookahead pointer that points to a future timeslot in the timeslot list (*FIFO and ordered buffers maintain a current pointer and future or last received pointer to signify the last entry in the queue*), and therefore it would have been obvious to one of ordinary skill in the art at the time of the invention because a use of these buffers are a well-known way of indicating order of requests to indicate priority based on order in which the entries were received. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.

Stacovsky orders based on timeslot and prioritizes certain requests, however, Stacovsky may not specifically disclose prioritizing based on if the request is of the first type (if first type of higher latency, initiate performance earlier than normal position of FIFO).

Furthermore, NPL2 discloses a system which prioritizing higher latency requests earlier than normal ordered operation (*Longest Processing Time (LPT): page 1*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to prioritizing based on if the request is of the first type in the system of Stacovsky, because NPL2 teaches the LPT is a heuristic used for finding the minimum makespan of

a schedule and no one large job will "stick out" at the end of the schedule and dramatically lengthen the completion time of the last job (*page 1*). Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp (*LPT scheduling algorithm*).

Furthermore, Stacovsky may not specifically disclose wherein, in step (c), the earlier position is selected so as to not be adjacent a position in the list for performance of another access request of the first type.

Examiner is taking official notice that that different types of access requests can be interleaved so as one type is not adjacent to the same type, and therefore it would have been obvious to one of ordinary skill in the art at the time of the invention because interleaving is a well-known concept which allows for no single type to monopolize a time period, thereby distributing evenly types in the timeslots. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp.

Although Stacovsky discloses read and writes types of memory requests to DRAM as shown above, Stacovsky may not disclose non-CPU write request having a higher latency associated with its performance than a non-CPU read request and CPU write request. Mundkur discloses conventional computer architecture includes CPU and peripheral devices accessing main memory (FIG. 1) and that the non-CPU (peripherals and other devices) requests have a higher latency associated with its

performance than CPU requests (*CPU on faster bus to main memory than peripheral slow shared system bus: FIG.1, column 1, lines 16-32*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to allow CPU and non-CPU requestors access to main memory with two separate buses, wherein non-CPU requests having a higher latency associated with its performance than a CPU request in the system of Stacovsky, because Mundkur teaches this was conventional type of architecture available at the time of the invention. Furthermore, it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp

Furthermore, Johnson discloses that a SDRAM memory device itself physically contains the limitation of the write cycle timing having a higher latency associated with its performance than the read cycle timing from the same device (*Tables in columns 7, 9, and 10; column 11, lines 34-40*).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use SDRAM which has a write request having a higher latency associated with its performance than a read request in the system of Stacovsky, because Johnson teaches this was a well-known type of DRAM available at the time of the invention. Furthermore, it would have been obvious because a person of ordinary

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skill has good reason to pursue the known options within his or her technical grasp.

Stacovsky may not disclose implementing an integrated circuit. Examiner takes official notice to the fact that Systems on a Chip (SoC) which contain entire systems on an integrated circuit were well known at the time of the invention and therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a SOC because an SOC provides increased speed, reduced energy and power consumption, and small footprint.

Concerning the claim language, each timeslot is configured to enable performance of a CPU write request then either a non-CPU write request or a non-CPU read request in that timeslot (*Stacovsky teaches write and/or reads being received in any order dependent upon the sources, programs, etc. While Mundkur teaches commands can come from CPU or non-CPU (ie peripheral) sources*).

Consider **claim 7**, and as applied to **claim 6** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the integrated circuit wherein the CPU write request has a lower latency associated with its performance than the non-CPU read request (*Mundkur: CPU on faster bus to main memory than peripheral slow shared system bus: FIG.1, column 1, lines 16-32*), step (c) including the timeslot arbitrator arbitrating in the timeslot list CPU write requests to be interleaved with non-CPU



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write and read requests (*Stacovsky discloses arbitrating reads and writes as disclosed above and Mundkur and Johnson discloses CPU and non-CPU requests with associated latencies; Examiners official notice from previous action: interleaving requests*).

Consider **claim 9**, and as applied to **claim 6** above, Stacovsky in view of NPL2, Mundkur and Johnson disclose the integrated circuit wherein the number of timeslots between the timeslot indicated by the lookahead pointer and the timeslot indicated by the current pointer takes into account a latency difference between performing the access requests (*Stacovsky: the timeslots or entries "take into account" the latency difference because they arrive in order of receipt even though relative to time one of higher latency could have been sent before a lower latency time request but received by the arbiter afterwards; NPL2: Furthermore, takes into account priority and latency: page 1*).

### ***Response to Arguments***

4. Applicant's arguments filed 06/01/2009 and 05/18/2009 have been fully considered but they are not persuasive. See above rejections and further explanation below.
5. The amended claim language of claims 1 and 6, "each timeslot is configured to enable performance of a CPU write request then either a non-CPU write request or a non-CPU read request in that timeslot" merely requires that

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each timeslot *can* (but not necessarily has to or in fact always does) enable performance of a CPU write request then either a non-CPU write request or a non-CPU read request in that timeslot. Any system capable of read and write commands from CPU and non-CPU sources is configured to do this. While the timeslot is merely an arbitrary grouping of time, and the system can receive requests in any order determined by the CPU and non-CPU sources. For instance, a peripheral requests a read and immediately following the CPU requests a read, and following a FIFO order the peripheral read would happen then the CPU read. However, if a CPU requests a write then a peripheral requests a write, then FIFO order dictates that timeslot that the CPU write request happens then the peripheral. Stacovsky teaches write and/or reads being received in any order dependent upon the sources, programs, etc. While Mundkur teaches commands can come from CPU or non-CPU (ie peripheral) sources.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew R. Chrzanowski whose telephone number is (571)270-1176. The examiner can normally be reached on M-F, 9-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matt Kim can be reached on (571)272-4182. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Matt Kim/  
Supervisory Patent Examiner, Art  
Unit 2186

/M. R. C./  
Examiner, Art Unit 2186  
08/03/2009